# Comments on the draft SWMI proposal of February 3, 2012

by Paul Lauenstein

Over the past quarter century since the Water Management Act (WMA) was passed in 1986, the Department of Environmental Protection (DEP) has been issuing and reviewing Water Management Act permits based on population and prior use without first determining safe yield limits as mandated by the Act. This has led to widespread degradation of aquatic ecosystems.

The draft Sustainable Water Management Initiative (SWMI) proposal presented on February 3, 2012 would allow excessive, increasing, and unnecessary allocations of groundwater for human use to be incorporated into the next round of WMA permits that will govern water withdrawals for the next 20 years, a period during which global warming may reach a tipping point of no return.

The time has come to reform water policy in Massachusetts to limit water withdrawals to safe and sustainable levels consistent with recent research by USGS et al[1] on the flow requirements of fluvial fish, which are indicators of ecosystem health, which, in turn, affects human health and well-being.

## Safe Yield

The Department of Environmental Protection's Statement of Clarification of Safe Yield of November 3, 2009 states, "Safe Yield interpretation includes environmental protection factors, including ecological health of river systems, as well as hydrologic factors."

The proposed safe yield formula of 55% of annualized Q90 drought flow translates to a withdrawal rate of approximately 0.3 cubic feet per second per square mile (cfsm) in most major basins in Massachusetts. USGS' research indicates that 25% of August median flow, which is equivalent to approximately 0.08 cfsm, is the most that can be withdrawn without degrading basins to a Biological Category of 4 or 5. In other words, the proposed safe yield formula would allow August withdrawals that are more than three times higher than science indicates is safe for aquatic ecosystems. Fish cannot survive in rivers and streams that are chronically desiccated in summer, even if enough flow is available during the rest of the year.

The safe yield determinations proposed on page 5 of the Framework Summary exceed current withdrawals in all 30 major basins, sometimes by wide margins, despite fact that August flow levels in 292 out of 1378 sub-basins (21%) are classified as 4 or 5 (i.e. seriously degraded) on a scale of 1 to 5. The safe yield determination of 64.8 MGD for the medium-stressed Charles River basin is almost double the 2008 reported withdrawals of 34.7 MGD. The safe yield determination of 14.8 MGD for the highly stressed Parker River basin is more than six times higher than current withdrawals of 2.3 MGD.

The proposed safe yield limits apply only to WMA-permitted water withdrawals. The regulatory framework does not account for withdrawals by the thousands of private wells in Massachusetts.

The proposed safe yield limits would not provide any more effective protection for rivers and wetlands in Massachusetts than the excessive safe yield determinations rescinded by DEP in November 2009. They have been characterized as a backstop for stream flow criteria, but as long as they are higher than current withdrawals in stressed basins, they would undermine efforts to impose effective conditions in permits and registrations, as well as efforts to promote water conservation.

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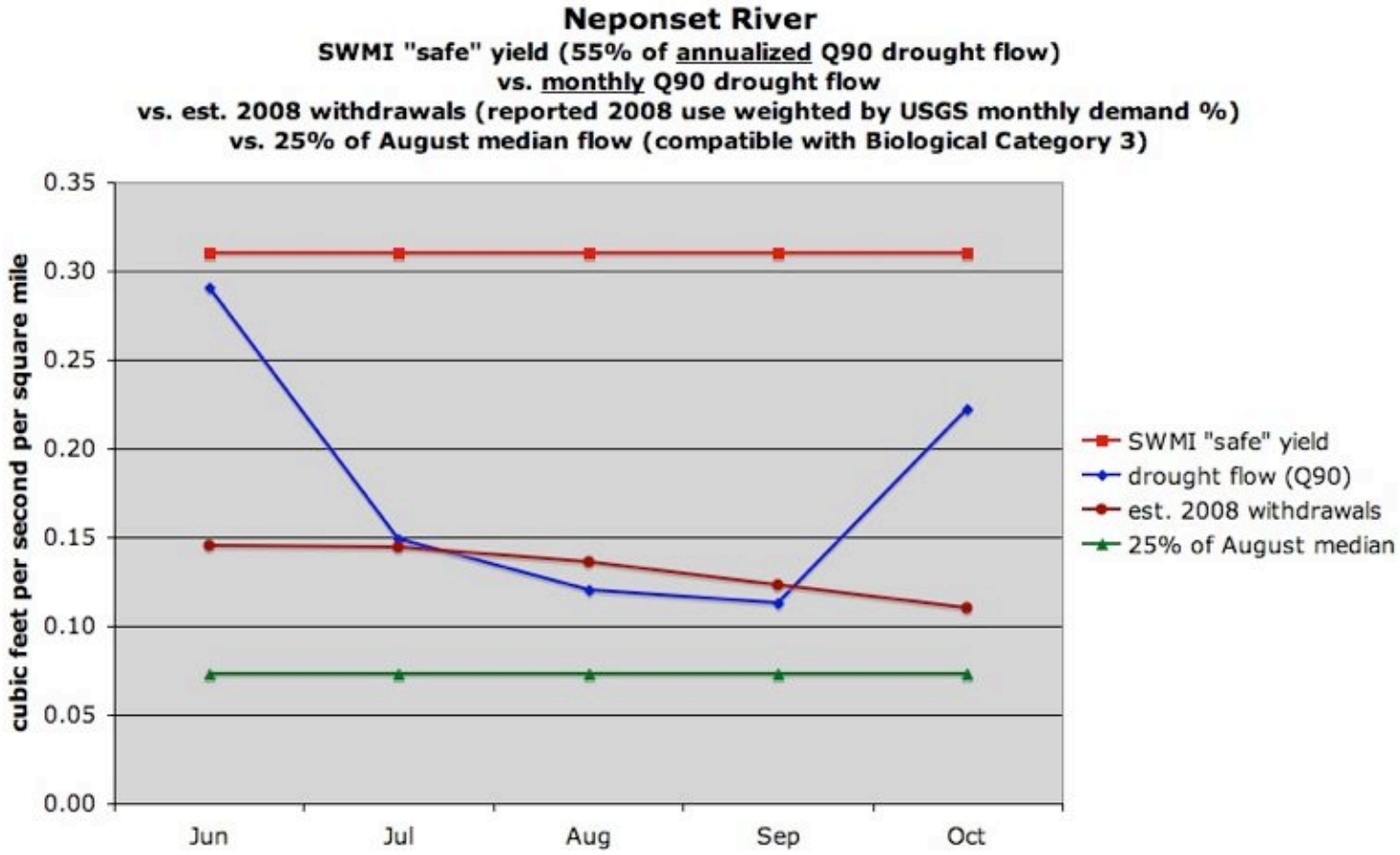
[1] David S. Armstrong, Todd A. Richards, and Sara B. Levin, Factors Influencing Riverine Fish Assemblages in Massachusetts, http://pubs.usgs.gov/sir/2011/5193/




*Current withdrawals in the stressed Neponset River basin are already higher than flow in a drought year. Withdrawing 25% of August median flow would leave enough water in the river to support Biological Category 3 conditions (on a scale of 1 to 5), even during a one-in-ten year (i.e. Q90) drought, whereas withdrawing SWMI "safe" yield would dry up the river for months during a Q90 drought, killing the fish and devastating the ecosystem.*

**Baselines for WMA permits**

Using the outdated time frame of 2003-2005 to establish baselines for WMA permit renewals would unnecessarily inflate them above current withdrawal levels, ignoring the trend toward greater water use efficiency in recent years. Arbitrarily allowing an additional 5% to 8% on top of 2003-2005 amounts is unnecessary and inappropriate because the potential for further improvement in water use efficiency (with its associated economic and environmental benefits) is substantial, and external sources of water such as MWRA and Aquaria are available.

Beyond these shortcomings, baseline allocations that exceed registrations represent a granting of water rights that have no basis in the Water Management Act.

**WMA registrations**

Using registrations to establish baselines would indicate that DEP has no intention of ever conditioning registrations, despite their legal authority to do so. Approximately 85% of the total authorized withdrawal volume in Massachusetts is registered. In many basins, registered volumes alone exceed 25% of August median flow, the maximum withdrawal that is compatible with ecological health of river systems according to USGS' research. Registrations established in the 1980's did not take environmental factors into consideration. Ceding the authority to condition registered withdrawals would severely compromise DEP's ability to manage water resources through regulation.

**Redundant wells**

Allowing transferal of registrations from old wells to new ones would perpetuate unregulated withdrawals that disregard ecological conditions and undermine safe yield withdrawal limits.

**WMA permitting tiers**

The four WMA permitting tiers are designed to accommodate existing and increased withdrawals rather than restore degraded river systems. Tier 1 requires development and implementation of a plan based on eight standard conditions intended to minimize the impacts of withdrawals to the greatest extent feasible, considering cost, level of improvement, authority of the permittee, and adaptive management. However, given the wiggle room in the application and enforcement of permit conditions, and the ecological degradation that has occurred over the past quarter century in spite of past permit conditions, there is reason to doubt the effectiveness of the eight standard Tier 1 permit conditions. Tiers 2 and 3 require mitigation of impacts commensurate with impact from additional withdrawals, but they do not require a net improvement in flow conditions. On the contrary, they allow backsliding within flow categories. Tier 4 could actually accommodate backsliding to a lower stream flow and/or biological category under certain circumstances.

Footnote B in the Tiers Table indicates that mitigation measures may be excused on the basis of cost, but provides no objective guidance on how to weigh the costs and benefits of such measures. With safe yields higher than existing withdrawals, it would be hard to justify any expenditure for mitigation or even for water conservation, which typically pays for itself over time.

DEP's practice of not taking any enforcement action unless permits are exceeded by at least 5% further weakens the effectiveness of permits in curtailing and/or mitigating withdrawals.

**Stream flow criteria**

SWMI's five-category system for classifying the biological condition and August flow alteration of streams and rivers, which is based on the excellent new research on the effect of flow alteration on fish populations, and, by proxy, river health, is a significant contribution to the sustainable management of our water resources. However, stream flow criteria by themselves cannot restore degraded rivers and streams. Stream flow criteria could provide guidance for effective WMA permit limits and conditions if not undermined by safe yield determinations that are higher than current withdrawals, baselines that extend water rights beyond the terms of the Water Management Act, registrations that DEP won't condition, and mitigation tiers that accommodate backsliding but do not require restoration.

**Flow triggers for bans on non-essential water use**

The proposed switch from reliance on a drought advisory to a gauge-based low-flow trigger would be an improvement because restrictions on non-essential outdoor water use in summer would go into effect in time to make a difference. However, the proposed trigger (annual 7-day impacted low-flow) is so low that stream flow would already be depleted before restrictions take effect. Furthermore, restrictions are not as stringent as total bans. WMA permits should impose triggers for total bans on non-essential water use, and leave restrictions to the discretion of local authorities. Also, unimpacted flow triggers generated by the Sustainable Yield Estimator (SYE) would be preferable to impacted flow triggers based on historical gauge readings, because they would activate bans earlier in a drought. Unimpacted August median flow would be more a prudent and protective trigger than one based on annual 7-day impacted low-flow, considering that the duration of a drought is never known until it is over. Also, stream flow can drop rapidly in hot, dry summer weather, and it can take several days to put a ban into effect.

Abnormally dry conditions reported on the U.S. Drought Monitor web site, which are updated weekly, could be considered as an alternative trigger for non-essential outdoor water use bans.

Bans on non-essential outdoor water use should be imposed in all communities in sub-basins with stream flows in Category 4 or 5, subject to 5-year permit reviews.

**Peak daily withdrawals**

In addition to annual withdrawal limits, WMA permits include limitations on peak daily withdrawals. Of the two, peak daily withdrawals arguably have more influence on ecosystem health because they occur in summer when demand for water is highest, and the environment has the least water to spare. The SWMI proposal does not say how peak daily withdrawal limits are to be determined, nor how high they should be. DEP currently sets maximum daily withdrawal limits according to hydrologic factors alone, without regard to environmental conditions.

**Wetlands**

Well pumping can affect freshwater wetlands that purify and store drinking water in many communities, and sustain base stream flow in summer. Desiccation of wetlands can reduce their storage capacity through decomposition of organic substrates, and allow encroachment of broadleaf vegetation whose transpiration accelerates the desiccation process, further stressing both streams and drinking water aquifers. Freshwater wetlands provide the highest ecosystem service value per acre of any land type[2]. Given the importance of maintaining healthy freshwater wetlands for both drinking water storage and purification, local Conservation Commissions should have a voice in setting limits and conditions on water withdrawals that affect wetlands.

**Nonmarket Ecosystem Service Value Estimates by Land Cover Type**

| Land Use Type | Ecosystem Services Used in Valuation | # Data Sources | Mean Total $acre/yr (2001 dollars) | Min value | Max value |
|---|---|---|---|---|---|
| Freshwater Wetland | Disturbance Prevention; Freshwater Regulation & Supply, Waste Assimilation, Aesthetic/Amenity, Soil Retention | 13 | **$15,452** | $7,684 | $31,772 |
| Saltwater Wetland | Disturbance Prevention, Nutrient Regulation, Habitat, Recreation | 10 | **$12,580** | $9,991 | $24,457 |
| Freshwater or Coastal Embayment | Freshwater Regulation and Supply, Habitat, Recreation, Aesthetic/Amenity | 25 | **$983** | $64 | $2,985 |
| Forest | Climate and Atmosphere, Disturbance Prevention, Habitat Refugium, Recreation | 8 | **$984** | $407 | $1,998 |
| Cropland | Aesthetic/Amenity, Soil Retention, Pollination | 3 | **$1,387** | $1,387 | $1,387 |
| Pasture | Aesthetic/Amenity, Pollination | 2 | **$1,381** | $1,381 | $1,381 |
| Woody Perennial | Pollination | 1 | **$49** | $49 | $49 |
| Urban Green Space | Waste Assimilation, Recreation | 3 | **$3,430** | $2,692 | $4,167 |

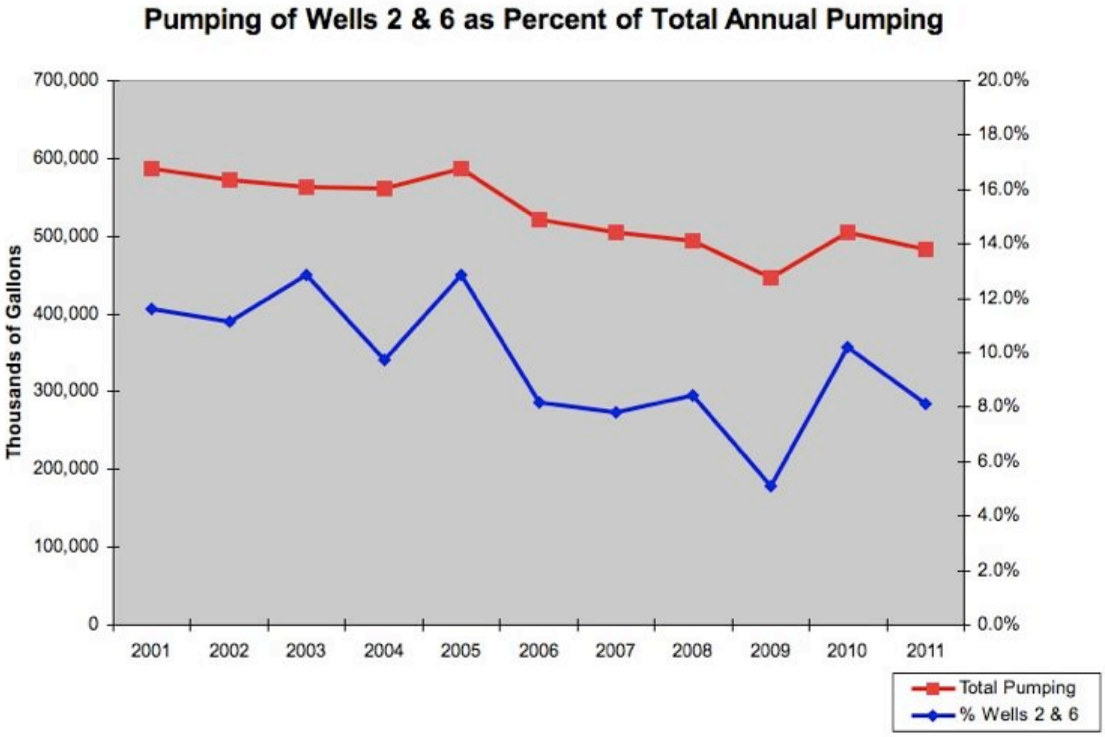
*Figure 21: Ecosystem service value by land cover type, and individual services used in calculation.*

[2]Massachusetts Audubon Society, Losing Ground: At What Cost?, Technical notes, page 44.

*Sharon's Atlantic White Cedar Swamp stores and purifies Sharon's drinking water. Note exposed cedar roots caused by subsidence of desiccated peat, and encroachment of broadleaf vegetation.*

**Drinking water quality**

Local water supplies often rely on multiple wells, some of which provide better water quality than others. Reducing demand through conservation to amounts that can be met by withdrawals from only the wells with the best water quality can improve the overall quality of the water supply. Also, pumping less water allows more time for natural processes to break down contaminants in groundwater. Water quality should be taken into account when determining the safe yield of groundwater wells.




*Sharon has six municipal wells. Well #2 contains up to 5 ppm of nitrates. Well #6 contains iron and manganese that discolors the water, staining laundry and plumbing fixtures. Consequently, the Water Department only pumps these two wells when necessary. Water conservation over the past decade has reduced the percentage of water required from these two wells.*

**The value of ecosystem services**

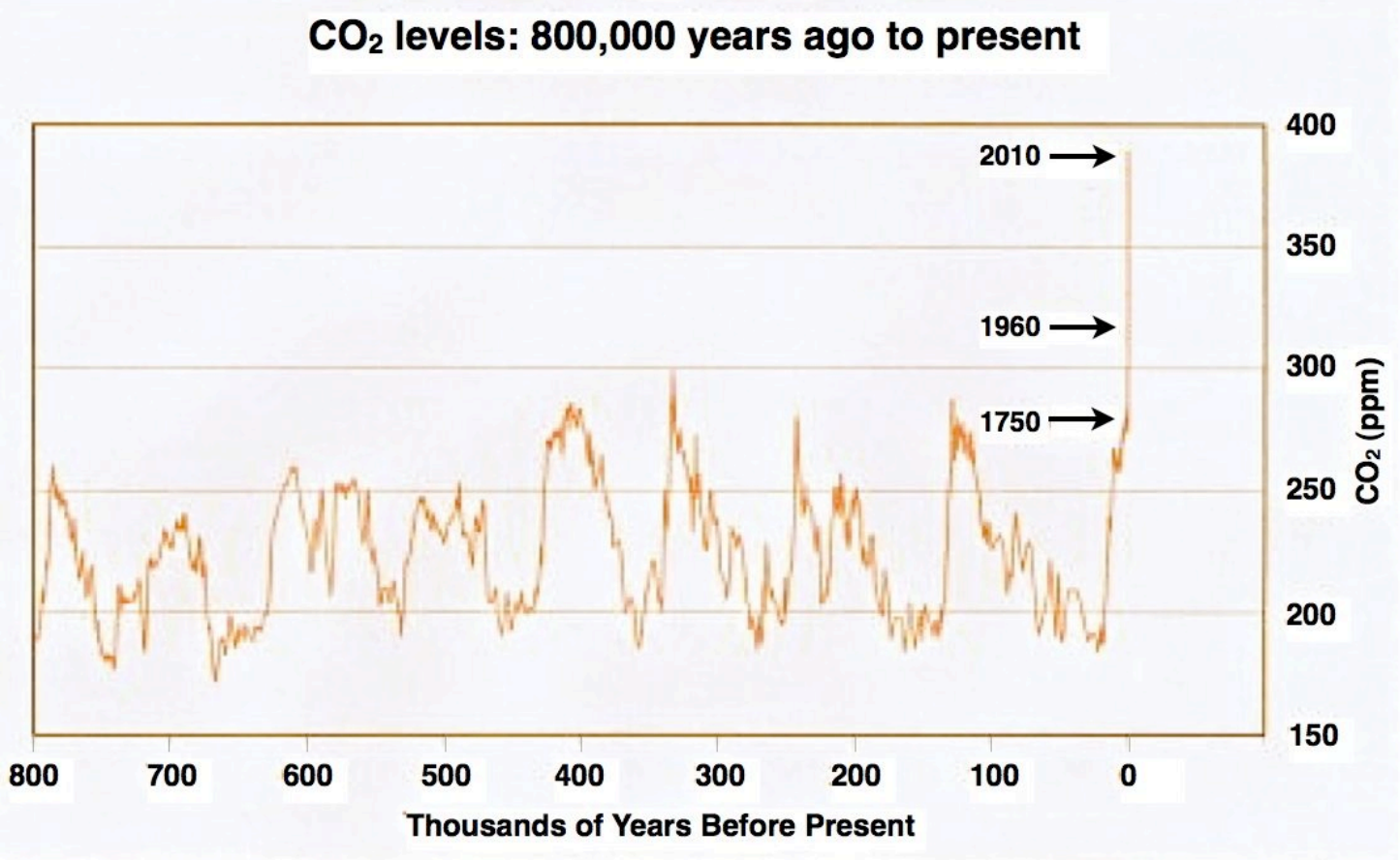
Ecosystem services in Massachusetts have been valued at $6.3 billion per year,[3] considerably more than the estimated $2.5 billion paid for all the water sold annually in Massachusetts. These services are provided by natural systems that cannot function without adequate water in the environment. Failure to institute protective safe yield limits could have costly consequences if artificial substitutes become necessary to replace ecosystem services currently provided for free.

**Wastewater treatment**

The cost of every gallon of water we use is more than matched by the cost to treat it when it becomes wastewater. Sewer bills are typically higher than water bills. Title V replacement of a septic system can cost more than all the water that passed through it.

Conserving water can reduce the frequency and volume of wastewater spills. In March 2010, extraordinarily high rainfall caused approximately 15 million gallons of sewage to spill from the Deer Island wastewater treatment plant into Boston Harbor. The reduction in water usage in the MWRA service area of over 100 million gallons per day over the preceding two decades helped keep that spill to a minimum.

Wastewater treatment, like water supply, requires energy. Combined, they account for a significant fraction of our total greenhouse gas emissions. The impact of those emissions on the atmosphere should be considered when making safe yield determinations. If we hope to achieve the 80% reduction in greenhouse gas emissions called for by the Global Warming Solutions Act, every sector of the economy must contribute, including water.




[3] Massachusetts Audubon Society, Losing Ground: At What Cost?, Technical notes, page 45.

Innovative wastewater treatment systems should be offered as mitigation options for communities requesting increased water allocations in their WMA permits. For example, greenhouses in Ipswich and Weston treat wastewater using constructed wetlands that mimic nature, returning purified effluent to the local aquifer while using far less energy than a conventional wastewater treatment facility. Another example is the foam-flush composting toilets at the Doyle Conservation Center in Leominster that use a small fraction of the water needed for conventional toilet flushing, and provide an opportunity to better manage human waste. A third example is the segregated plumbing at Foxboro Stadium that recycles treated wastewater for toilet flushing, conserving large amounts of virgin water on game days.

**Conclusions**

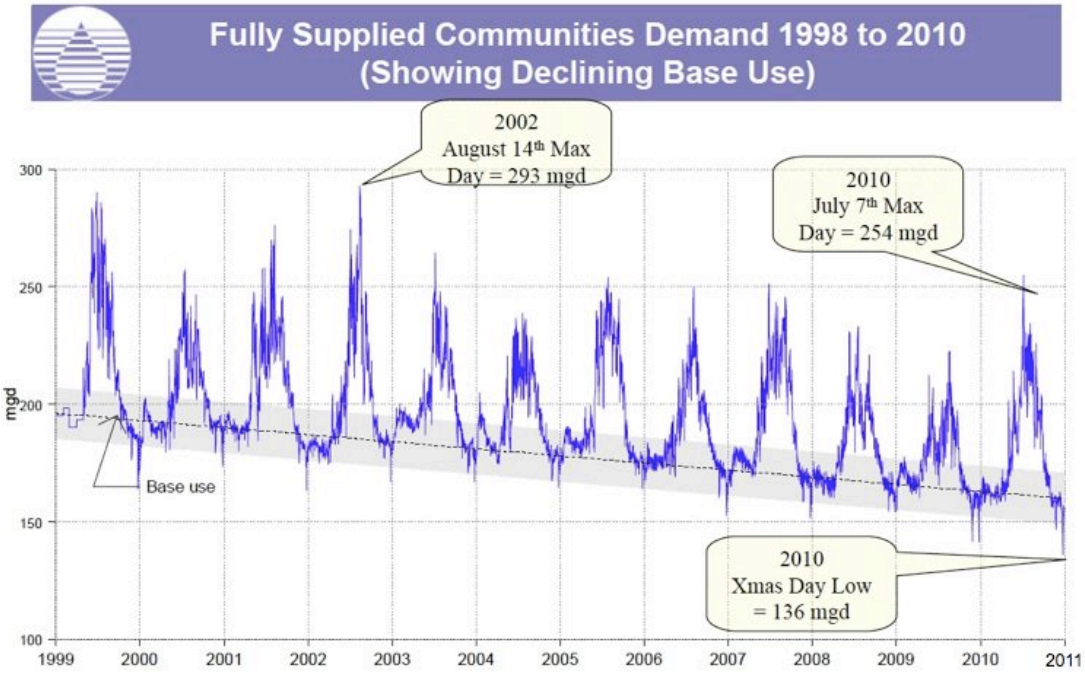
The water management framework proposed by SWMI is oriented to accommodating water withdrawals rather than protecting the environment and drinking water quality. It would do little to prevent excessive well pumping from:

- continuing to diminish highly valuable ecosystem services provided by rivers, lakes and wetlands, and accelerating the decline of species such as brook trout, freshwater mussels and river herring.
- compromising drinking water quality and quantity.
- driving up the cost of pure, safe drinking water.
- increasing the cost of wastewater treatment, and the frequency and volume of wastewater spills.
- adding to greenhouse gas emissions associated with well pumping, water treatment and wastewater treatment, contrary to the goals of the Global Warming Solutions Act.

In short, the provisions of the SWMI proposal would continue to accommodate excessive, costly and unnecessary water withdrawals that compromise quality of life for present and future generations.

Instead of continuing to allow ever-increasing withdrawals regardless of the consequences, WMA permits and registrations should be structured to encourage reductions in water usage. The rate of those reductions should be geared to reach protective, science-based safe yield limits by 2050, the same time frame as reaching the goals of the Global Warming Solutions Act.

Substantial improvement in water use efficiency is achievable. Rising water rates associated with increasing costs of water supply infrastructure, progressive conservation-oriented water rate structures, and ever more efficient plumbing technology are already driving down water usage. Thanks to the storage capacity of its reservoirs and its progress with water conservation, MWRA can provide supplementary water to many communities whose local water sources are currently stressed.




*Demand for MWRA water is declining at a rate of about 1.8% per year, despite the recent addition of Reading to the list of fully-supplied communities.*

**Recommendations**

A credible SWMI proposal would lay the groundwork for ecological restoration by providing:

• safe yield limits on annual water withdrawals that would protect fluvial fish according to scientific research that was conducted at taxpayer expense for this purpose. A safe yield formula of 25% of median August flow would allow withdrawals consistent with Flow Category 3. A truly protective safe yield formula would further restrict withdrawals during drought conditions, and also account for other factors such as private well withdrawals, greenhouse gas emissions, and DEP's practice of allowing annual withdrawals that exceed permit limits by up to 5% before taking enforcement action. Safe Yield should be expressed in cfsm rather than MGD, so it can be customized for any location in any basin or sub-basin.

• limits on maximum daily withdrawals based on environmental protection rather than well pumping capacity.

• a schedule for gradually reducing WMA permits to reach protective safe yield limits by 2050, the deadline for reaching greenhouse gas emission goals specified in the Global Warming Solutions Act.

• regulations that would allow DEP to impose conditions on registrations in cases where they exceed protective safe yield, and continue to disallow transfer of registrations from old well sites to new ones.

• WMA permit conditions that require progressive, steeply ascending block water rates and elevated summer rates, and limit revenue from fixed base fees to no more than 10% of total revenue. Water rates generate revenue to pay the cost of operating and maintaining water supply infrastructure, but nobody has to write a check to pay for the environmental damage caused by water withdrawals. Amplifying the incentive to conserve water through steeply ascending block rates, low fixed base fees and significantly higher summer rates can help mitigate the hidden environmental cost of water withdrawals.

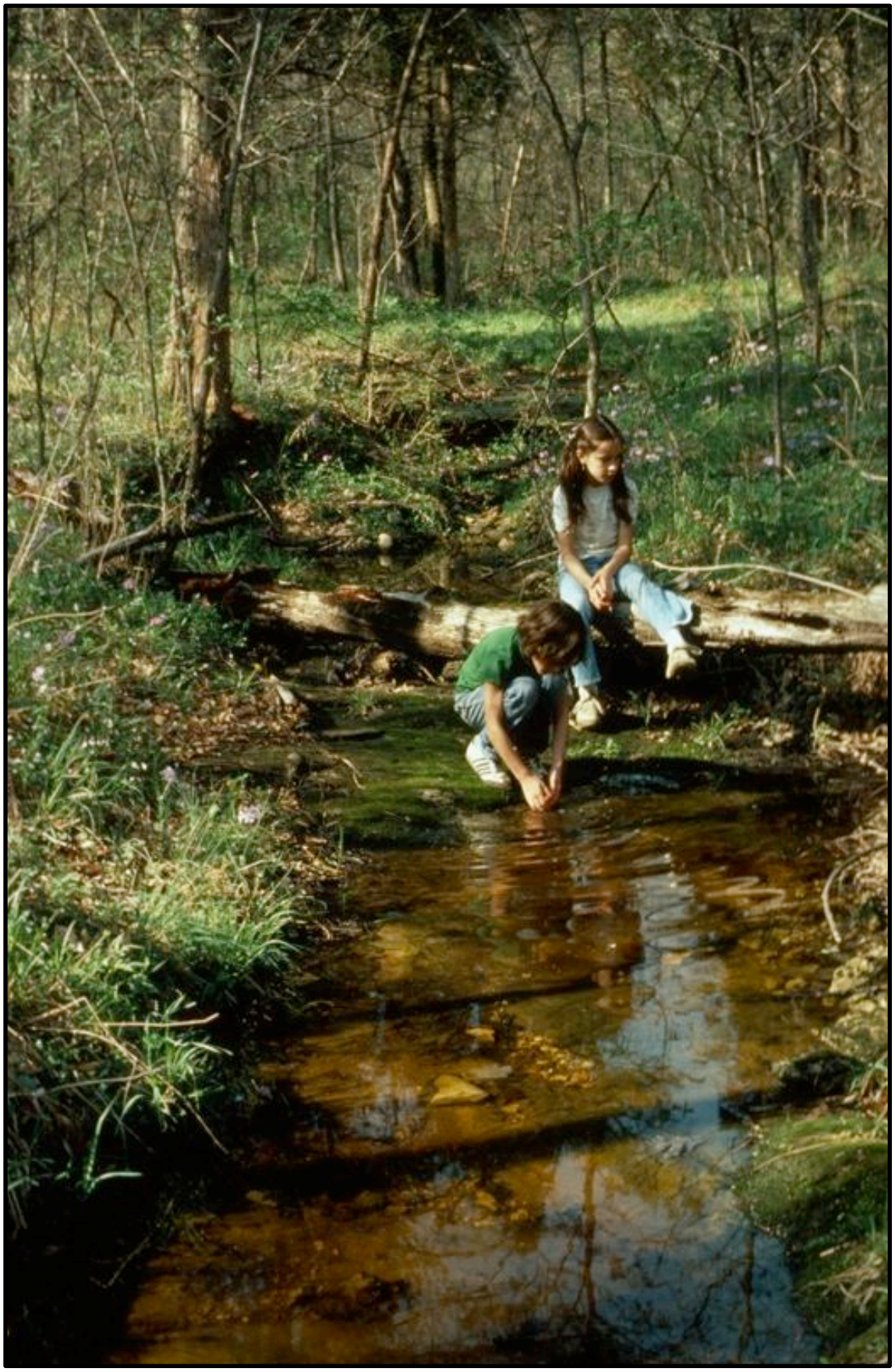
• WMA permit conditions that require at least two gallons worth of mitigation for every gallon of increased withdrawal, as exemplified by Weymouth's successful water-banking program.

• protective stream flow triggers, such as monthly Q50 median flow, in all permits that would restrict or ban non-essential outdoor water use while there is still enough groundwater remaining to weather a prolonged drought. Restrictions and bans should apply equally to non-essential use of water from both public and private sources.

• an adaptive management process to review safe yield limits prior to five-year reviews of WMA permits, and revise them as needed, accounting for such variables as increases in private well withdrawals and climate change.

## A new water ethic

Allowing our water resources to suffer the so-called Tragedy of the Commons is unacceptable. We should respond honestly and effectively to the degradation of the past quarter century. We need a new water ethic that challenges all of us to tap the vast resource of water use efficiency. Setting safe yield limits at levels that are safe for the environment would be a good start.



*"We do not inherit the Earth from our ancestors, we borrow it from our children."*
*– Native American proverb*